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# THE HENBURY METEORITE CRATERS

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# The Henbury Meteorite Craters

Paul W. Hodge[1]

Among the many terrestrial craters now recognized as having been caused by meteoritic impact, the remarkable group of craters near the Henbury Homestead in central Australia is of special interest. In size, shape, and degree of erosion they illustrate almost all the features of known meteorite craters. Because there is so little published information on the Henbury craters, I attempted, while carrying out a study of meteoritic debris in the soil around them, to obtain a series of useful photographs of the craters and surrounding region. The publication of some of these photographs in the present form is desirable for three reasons. First, the increased interest in the general subject of meteorite craters has captured a large new audience who may find these photographs useful; second, the photographs may be used in connection with past pictures, such as the unpublished set made by Bedford in 1931, and future photographs to establish the amount and rate of erosion in order to estimate the age of the craters; third, the rapidly increasing number of visitors to the craters makes it advisable that a permanent record of their present condition be made. Approximately 50 groups now visit the location of the craters each year; most of these are local people or tourists. The fast-growing tourist industry in the area suggests that tour buses may soon bring much larger numbers of visitors. Such a situation may result in the accidental alteration of some of the features of the craters.

## Location

The Henbury meteorite craters are located in the heart of arid central Australia at latitude 24°35′ S and longitude 133°10′ E. They lie just north of a low linear range of hills. Their geological environment has been described by Alderman (1932). At present they are best reached by driving 80 miles from the city of Alice Springs toward Adelaide, turning left opposite the Henbury Station airstrip, and continuing on a crude track for 6 miles. The immediate area around the craters has recently been set aside as a government reserve.

## History of scientific work

*1931, May.*—Acting on reports of local residents that meteorites were to be found in the vicinity of 3 to 5 craters near Henbury, A. R. Alderman (1932) carried out the first scientific study of the Henbury meteorite craters. He discovered, mapped, and described 13 craters, which ranged in size from 9 to 200 meters. In addition to making rough measurements of the diameters, depths, and all heights of the craters, Alderman also combed the entire area for meteorites and meteoritic fragments. He found approximately 800 pieces of meteoritic material, whose weights ranged from a few grams to 24 kilograms. He bored one of the craters (no. 5) to a depth of 8 feet and found no evidence for a large meteorite there.

*1931, June.*—Following Dr. Alderman's expedition, R. Bedford of the Kyancutta Museum organized a party consisting of himself, his brother W. Bedford, and B. Duggin, to explore the craters. On their first visit Bedford's group concentrated on finding meteoritic fragments on the ground surrounding the craters. A total of 550 meteorites was collected; they ranged in weight from 3 grams to 77.5 kilograms, totaling 146 kilograms. The results of the expedition were never published, except as an addendum to Alderman's paper, written by Spencer.

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*1932.*—In the following year the Bedfords returned to the Henbury craters planning to search for large meteorites by digging in the centers of the craters themselves. They excavated four of the craters (nos. 10, 11, and 13 of Dr. Alderman's list) and a nearby probable crater not included in Alderman's study. In crater no. 13 several pieces of meteoritic iron, totaling approximately 80 kilograms, were found at a depth of 2 meters below the floor.

*1937.*—Five years later, J. M. Rayner (1939) and his associates carried out a magnetic survey of the Henbury craters. Magnetic traverses across 12 of the craters (all but no. 9 of Alderman's list) produced the definite result that no large magnetic anomalies exist in the region and therefore that no large meteoritic body can be intact under the surface except at improbably great depths. Within the craters 10 small local anomalies were discovered, the most conspicuous being in craters nos. 5, 12, and 13. The geophysical results strongly suggest that these anomalies might be caused by small masses of meteoritic iron buried at shallow depths in the crater area. The cause of the anomaly in crater 5 was found to be an 18-kilogram meteorite. The causes of the anomalies in craters 12 and 13 apparently remain there. Rayner found 16 other small anomalies, half of them falling near the crater walls and the other half falling at considerable distances from the craters. These may indicate the existence of pieces of meteoritic material buried at shallow depths.

*1962.*—The geologist C. H. Chao visited the Henbury craters and looked for shatter cones and other indications of impact. The results have not yet been published.

*1963.*—Meteoriticists E. P. Henderson and Brian Mason carried out a search for meteorites at the Henbury craters; their results have not yet been published.

*1963.*—A very detailed geological map, as well as a topographical study, of the main craters (nos. 6, 7, and 8) was constructed after a prolonged study of the craters by D. J. Milton. The results are not yet published.

*1963.*—The author carried out a soil survey of the ground surrounding the craters in an attempt to establish the distribution of microscopic meteoritic material around the craters and to estimate the total mass of the original meteorites. Results of this recent research will be published later in these *Contributions.*

**The craters**

Table 1 lists all craters that have been either definitely or tentatively identified and gives data regarding them. In addition to the 13 craters described by Alderman there is a fourteenth, excavated by Bedford and not described in previous literature, and a fifteenth object, tentatively identified, as a result of my inspection on the ground and from the air, as a new small crater. I have measured the diameters of all craters by means of aerial photographs. The heights of the rims given in the table are those estimated either by Alderman (1932) or by myself.

TABLE 1.—*Dimensions of the Henbury meteorite craters*

| Crater | Mean diameter (m.) | Approximate mean height of rim (m.) | | Figure No. |
|---|---|---|---|---|
| | | Above surroundings | Above floor | |
| 1 | 20 | 0 | 0 | 2, 4 |
| 2 | 24 | 0 | 0 | 2, 4 |
| 3 | 42 | 0.5 | 4 | 2, 4, 9, 10, 11 |
| 4 | 47 | 0.4 | 4 | 2, 4, 12, 13 |
| 5 | 20 | 0.1 | 0.8 | 2, 4, 9, 14 |
| 6 | 79 | 4.5 | 6 | 2, 3, 6, 8 |
| 7 | 157×112 | 4.5 | 16 | 2, 3, 6, 7 |
| 8 | 54 | 3.1 | 3 | 2, 3, 6 |
| [a] 9 | ? | 0 | 0 | 2, 3 |
| 10 | 23 | 0.1 | 0.1 | 2, 5, 15 |
| 11 | 14 | 0.1 | 0.1 | 2, 4, 5, 16 |
| 12 | 24 | 0.2 | 2 | 2, 5, 17 |
| 13 | 9 | 0 | 0.1 | 2 |
| [b] 14 | ? | ? | ? | 2 |
| [c] 15 | 8 | 0 | 0.5 | 2, 5 |

[a] Doubtful.
[b] Location unknown.
[c] Probable.

**Acknowledgments**

I am indebted to A. R. Hogg, J. M. Rayner, and T. Quinlan for generously making arrangements and providing for my visit to the craters. I am especially grateful to geologist Donald Woolley who took me to the craters and helped me considerably in the work there.

**References**

Alderman, A. R.
1932. The Meteorite Craters at Henbury, Central Australia. Mineralogical Magazine, vol. 23, pp. 19–32.

Rayner, J. M.
1939. Examination of the Henbury Meteorite Craters by the Methods of Applied Geophysics. Report of the Australian and New Zealand Assn. for the Advancement of Science, vol. 24, pp. 72–78.

***Abstract***

Renewed interest in the Henbury Meteorite Craters has instigated several recent scientific studies of these unique objects. This paper summarizes the published and unpublished research that has been carried out so far and presents a table of dimensions newly derived, primarily from aerial photographs. A probable new crater is described, and a new map of crater outlines and locations is given. Sixteen photographs record the present condition of the crater system and form a photographic atlas of the craters and their surroundings.

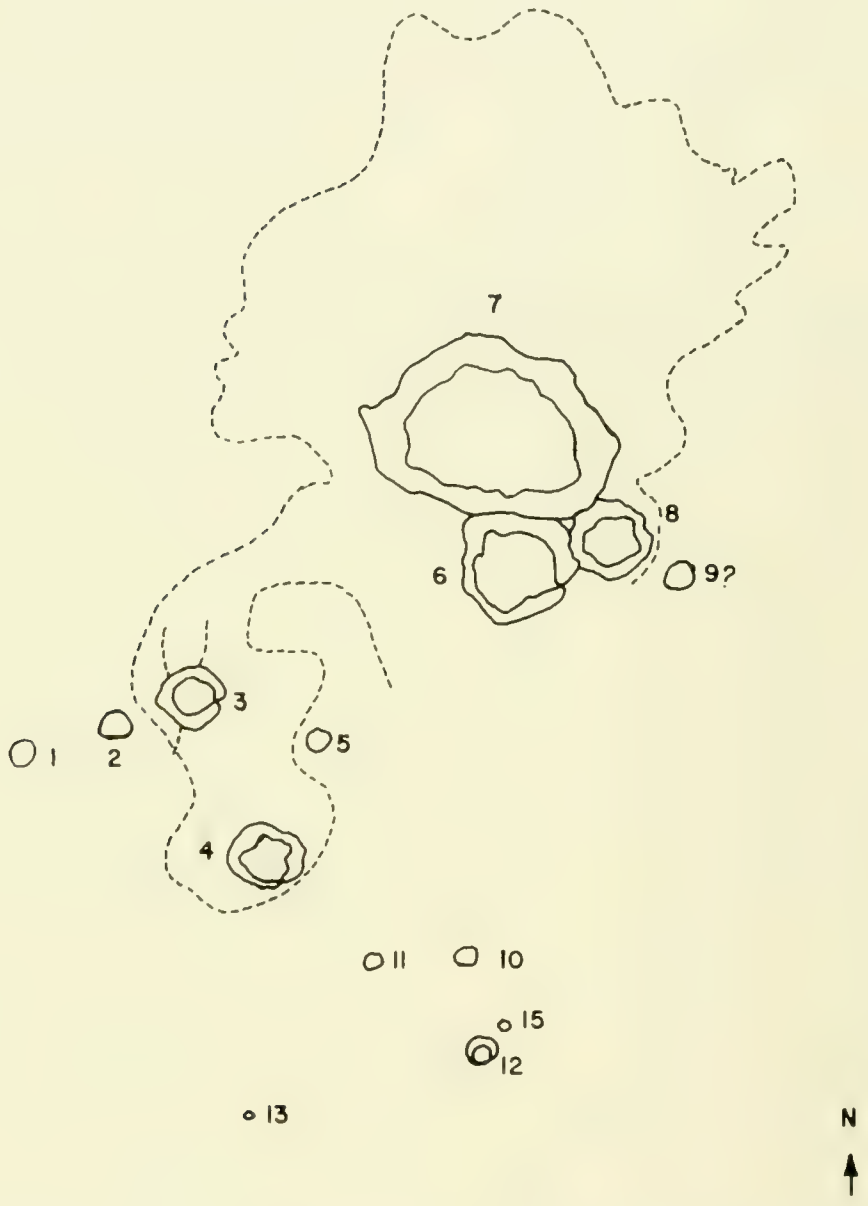


FIGURE 1.—Outline map of the Henbury meteorite craters, derived from aerial photographs. The tops of the rims and the outer perimeters of the floors are both indicated. Crater numbers are those assigned by Alderman (1932), except for crater 15, which was found after Alderman's study. Dotted lines indicate the area over which rock debris from the explosions can be traced on aerial photographs. Dashed lines trace the location of the rays emanating from crater 3 (see Rayner, 1939).

FIGURE 2.—Henbury craters as shown on the aerial photographs of the Division of National Mapping, Canberra, Australia (reproduced through the courtesy of the Division).


Figure 3

Figure 4


Figure 5

FIGURE 3.—Aerial photograph taken from a light plane from approximately 1000 feet above the Henbury craters, showing craters 6, 7, 8, and 9 from the south.

FIGURE 4.—Aerial photograph, taken as above, showing (from left to right) craters 1, 2, 3, 4, 5, 7, and 11 from the southwest.

FIGURE 5.—Aerial photograph, taken as above, showing craters 10, 11, 12, and 15.



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Figure 6

Figure 7

Figure 8

Figure 6.—The three main craters as seen from the ridge to the south. The inconspicuous rim of the largest crater (no. 7) extends from the left edge of the photograph almost to its right edge. Crater 6, the water crater, is conspicuous because of the large number of trees growing within it. Crater 8 is to its right.

Figure 7.—Interior of the largest crater (no. 7), looking north from its southeast rim. The gentle slope of its walls shows considerable erosion. The walls rise approximately 50 feet above the floor.

Figure 8.—Floor of crater 6, the water crater, consisting at the time of the photograph of a flat, dry mud area serrated by cattle footprints. This photograph looks east from the floor toward the common rim of craters 6 and 8.


Figure 9

Figure 10

Figure 11

FIGURE 9.—Inconspicuousness of the craters is illustrated in this photograph of craters 3 and 5, taken from the northeast, near the main crater. Crater 3 is visible only because of the trees extending out of it.

FIGURE 10.—Interior and south walls of crater 3, taken from its north rim, showing that although the wall is quite high, the rim does not extend conspicuously above the surrounding area.

FIGURE 11.—Crater 3 from its east rim, demonstrating the considerable erosion of the south wall.

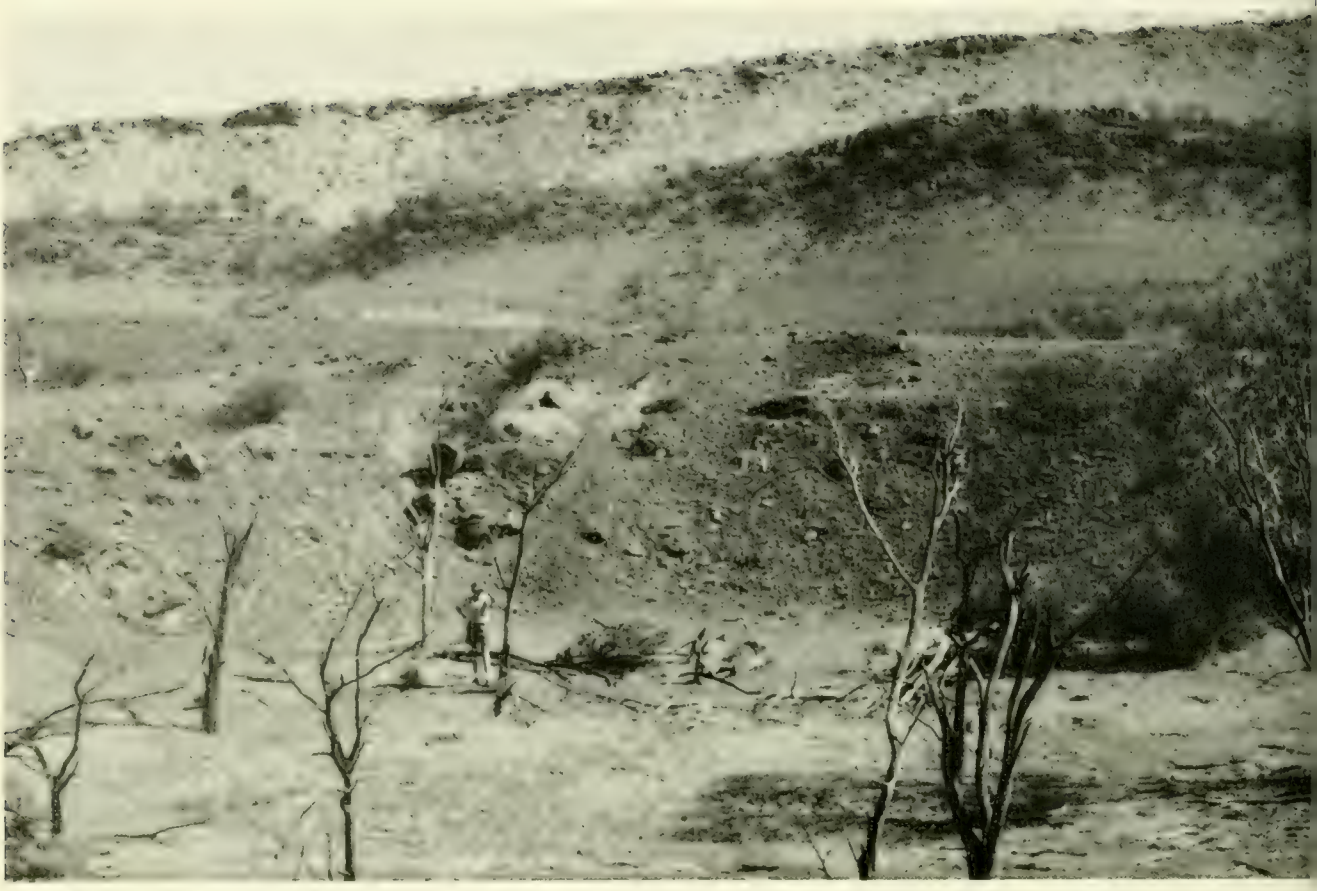

Figure 12

Figure 13

Figure 14

FIGURE 12.—Floor of crater 4 from its north rim. The scale of the photograph can be gauged from the figure standing near the base of the south wall.

FIGURE 13.—Crater 4 from its floor near the south wall, looking toward the west rim.

FIGURE 14.—Crater 5 from its almost imperceptible east rim. Erosion has so reduced this rim that this crater is now one of the more inconspicuous; it is noticeable primarily because of the fine sediments covering its floor and because of its trees.

Figure 15

Figure 16

Figure 17

FIGURE 15.—Crater 10 photographed from the north. Bedford excavated this small crater in 1932.

FIGURE 16.—Crater 11 from the east. This inconspicuous crater, with no walls, was also excavated by Bedford.

FIGURE 17.—Crater 12 from the west. Because this crater is on the side of a moderately steep slope, its walls vary from almost no height at the south (right) to 4 meters on the north side (left).